UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/710,250	06/29/2004	Qin Jiang	DP-300915	4249

22851 7590 12/13/2007

DELPHI TECHNOLOGIES, INC.
M/C 480-410-202
PO BOX 5052
TROY, MI 48007

EXAMINER	
DAM, DUSTIN Q	
ART UNIT	PAPER NUMBER
4128	
MAIL DATE	DELIVERY MODE
12/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/710,250	JIANG ET AL.	
	Examiner	Art Unit	
	DUSTIN Q. DAM	4128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 June 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☒ Claim(s) *20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *June 29, 2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Summary

1. This is the initial Office Action based on the Stacked Thermocouple Structure and Sensing Devices Formed Therewith.

2. Claims 1-20 are currently pending and have been fully considered.

Oath/Declaration

3. The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by application number and filing date is required. See MPEP §§ 602.01 and 602.02.

The oath or declaration is defective because:
It was not executed in accordance with either 37 CFR 1.66 or 1.68.

Claim Objections

4. Claim 20 is objected to because of the following informalities: Claims 16 and 20 are duplicate claims depending from independent claim 12. It is construed that applicant intends to only claim the limitations of claim 16 and to remove the duplicate claim, claim 20. Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are

such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. Claims 1-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over HAMAMOTO et al. (U.S. PG-Pub 2002/0185169 A1).

a. With regards to claim 1, HAMAMOTO et al. discloses a stacked thermocouple structure (FIG. 1) comprising a plurality of first conductors (6, FIG. 1 & 2) on a surface (1a, FIG. 2) and forming a first material (1st sentence, **[0041]**), each of the first conductors having first and second ends and a thickness in a direction normal to the surface (FIG. 1 & 2), a dielectric layer (7, FIG. 2) on each of the first conductors, a plurality of second conductors (8, FIG. 1 & 2) on the dielectric layer and formed of a second material (2nd sentence, **[0041]**) that differs from the first material, Each second conductors having a thickness in a direction normal to the surface (FIG. 1 & 2), a first end overlying and contacting the first end of the corresponding first conductor (FIG. 1), and a second end overlying but separated from the second end of the corresponding first conductor by the dielectric layer (FIG. 1 & 2), and a plurality of third conductors (8, FIG. 1 & 2). As depicted in FIG. 2, the portion of the conductor 8, that fills contact holes 7a, is construed to be the second conductors while the portion of conductor 8 that is above and

to the side of contact holes 7a, is construed to be the third conductors. HAMAMOTO et al. discloses the third conductors (8, FIG. 1 & 2) electrically interconnecting the second end of one of the second conductors with the second end of one of the first conductors other than the first conductor on which the second conductor lies (FIG. 1).

b. With regards to independent claim 1, HAMAMOTO et al. does not appear to explicitly teach the second conductor having a thickness that is smaller than the thickness of the third conductor as claimed in claims 1 and 12 or a thickness that is three times smaller than that of the third conductor as claimed in claims 4 and 14. However, FIG. 2 appears to depict the second conductor (8 at the portion filling the contact holes 7a, FIG. 2) to be three times thinner than that of the third conductor (8 at the portion above and to the side of contact holes 7a, FIG. 2). Alternatively, it would have been obvious to a person with ordinary skill to have the portion of the second conductors, which fill the contact holes, to be thinner than the third conductors since the contact holes are formed from a solid dielectric layer (7, FIG. 2) in which a thinner layer would yield less material to etch, or remove by other processes, to create the contact holes (7a, FIG. 2).

c. With regards to claim 2, HAMAMOTO et al. discloses second conductors (8, FIG. 1 & 2), in the portion that fills contact holes 7a, and third conductors (8, FIG. 1 & 2) which are formed with the same material as the second conductors (2nd sentence, **[0041]**).

d. With regards to claim 3, HAMAMOTO et al. does not appear to explicitly disclose the dielectric layer having a thickness less than the thickness of the second conductor. However, it would have been obvious to a person having ordinary skill in the art to form a dielectric layer that has a thickness less than that of the thickness of the

second conductor since the only difference between the claimed invention, as claimed in claims 3 and 13, and the thermopile sensor, as disclosed by HAMAMOTO et al., is the claimed relative proportions of the dielectric layer and the second conductor, which the dielectric layer in the claimed invention would not perform differently than that of the thermopile sensor disclosed by HAMAMOTO et al. which is to insulate the first and second conductors from one another except at the contact hole portions (MPEP 2144.04 A) since it is generally obvious to change the relative dimensions. Alternatively, it would have been obvious to a person with ordinary skill to form a dielectric layer that has a thickness less than that of the thickness of the second conductor since the contact holes are formed from a solid dielectric layer (7, FIG. 2) in which a thinner layer would yield less material to etch, or remove by other processes, to create the contact holes (7a, FIG. 2).

e. With regards to independent claim 4, HAMAMOTO et al. does not appear to explicitly teach the second conductor having a thickness that is smaller than the thickness of the third conductor as claimed in claims 1 and 12 or a thickness that is three times smaller than that of the third conductor as claimed in claims 4 and 14. However, FIG. 2 appears to depict the second conductor (8 at the portion filling the contact holes 7a, FIG. 2) to be three times thinner than that of the third conductor (8 at the portion above and to the side of contact holes 7a, FIG. 2). Alternatively, it would have been obvious to a person with ordinary skill to have the portion of the second conductors, which fill the contact holes, to be thinner than the third conductors since the contact holes are formed

from a solid dielectric layer (7, FIG. 2) in which a thinner layer would yield less material to etch, or remove by other processes, to create the contact holes (7a, FIG. 2).

f. With regards to claim 5, HAMAMOTO et al. discloses the third conductors (8, FIG. 1) and the second ends of the first and second conductors defining a cold junction (12, FIG. 1 and 3rd sentence, **[0045]**).

g. With regards to claim 6, HAMAMOTO et al. discloses the first material being polysilicon (1st sentence, **[0041]**) and the second material being aluminum (2nd sentence, **[0041]**).

h. With regards to claim 7, HAMAMOTO et al. discloses the first and second conductors which define steps and are traversed by the third conductors (FIG. 2).

i. With regards to claim 8, HAMAMOTO et al. discloses the surface defined by a second dielectric layer (5, FIG. 2) on a substrate (1, FIG. 2) and each of the first conductors (6, FIG. 2) is on the second dielectric layer.

j. With regards to claim 9, HAMAMOTO et al. discloses the second conductors (8, FIG. 2 {the portion filling contact holes 7a}) having lateral widths less than lateral widths of the first conductors (6, FIG. 2) so as to define steps from the substrate to the second conductors, the steps being traversed by the third conductors.

k. With regards to claim 10, HAMAMOTO et al. discloses a thermopile sensor which include power terminals (13 & 14, FIG. 1) and inherently produces an output dependent on a temperature difference between the first (11, FIG. 1) and second (12, FIG. 1) ends of the first and second conductors.

l. With regards to claim 11, HAMAMOTO et al. discloses a thermopile that is a component of a thermal sensor package (1st sentence, **[0002]**).

m. With regards to claim 12, HAMAMOTO et al. discloses a stacked thermocouple structure of a thermopile (FIG. 1) that inherently produces an output dependent on a temperature difference between hot (11, FIG. 1) and cold (12, FIG. 1) junctions of the thermopile, the stacked thermocouple structure comprising a plurality of first conductors (6, FIG. 1 & 2) on a surface (1a, FIG. 2) and forming a first material (1st sentence, **[0041]**), each of the first conductors having first and second ends and a thickness in a direction normal to the surface (FIG. 1 & 2), a dielectric layer (7, FIG. 2) on each of the first conductors, a plurality of second conductors (8, FIG. 1 & 2) on the dielectric layer and formed of a second material (2nd sentence, **[0041]**) that differs from the first material, Each second conductors having a thickness in a direction normal to the surface (FIG. 1 & 2), a first end overlying and contacting the first end of the corresponding first conductor (FIG. 1) to define one of the hot junctions (11, FIG. 1), and a second end overlying but separated from the second end of the corresponding first conductor by the dielectric layer (FIG. 1 & 2), and a plurality of third conductors (8, FIG. 1 & 2) formed of a second material (2nd sentence, **[0041]**). As depicted in FIG. 2, the portion of the conductor 8, that fills contact holes 7a, is construed to be the second conductors while the portion of conductor 8 that is above and to the side of contact holes 7a, is construed to be the third conductors. HAMAMOTO et al. discloses the third conductors (8, FIG. 1 & 2) electrically interconnecting the second end of one of the second conductors with the

second end of one of the first conductors other than the first conductor on which the second conductor lies (FIG. 1) and defines one of the cold junctions (12, FIG. 1).

n. With regards to independent claims 12 and 14, HAMAMOTO et al. does not appear to explicitly teach the second conductor having a thickness that is smaller than the thickness of the third conductor as claimed in claim 12 or a thickness that is three times smaller than that of the third conductor as claimed in claim 14. However, FIG. 2 appears to depict the second conductor (8 at the portion filling the contact holes 7a, FIG. 2) to be three times thinner than that of the third conductor (8 at the portion above and to the side of contact holes 7a, FIG. 2). Alternatively, it would have been obvious to a person with ordinary skill to have the portion of the second conductors, which fill the contact holes, to be thinner than the third conductors since the contact holes are formed from a solid dielectric layer (7, FIG. 2) in which a thinner layer would yield less material to etch, or remove by other processes, to create the contact holes (7a, FIG. 2).

o. With regards to claim 13, HAMAMOTO et al. does not appear to explicitly disclose the dielectric layer having a thickness less than the thickness of the second conductor. However, it would have been obvious to a person having ordinary skill in the art to form a dielectric layer that has a thickness less than that of the thickness of the second conductor since the only difference between the claimed invention, as claimed in claims 3 and 13, and the thermopile sensor, as disclosed by HAMAMOTO et al., is the claimed relative proportions of the dielectric layer and the second conductor, which the dielectric layer in the claimed invention would not perform differently than that of the thermopile sensor disclosed by HAMAMOTO et al. which is to insulate the first and

second conductors from one another except at the contact hole portions (MPEP 2144.04 A) since it is generally obvious to change the relative dimensions. Alternatively, it would have been obvious to a person with ordinary skill to form a dielectric layer that has a thickness less than that of the thickness of the second conductor since the contact holes are formed from a solid dielectric layer (7, FIG. 2) in which a thinner layer would yield less material to etch, or remove by other processes, to create the contact holes (7a, FIG. 2).

p. With regards to claim 15, HAMAMOTO et al. discloses the first material being polysilicon (1st sentence, **[0041]**) and the second material being aluminum (2nd sentence, **[0041]**).

q. With regards to claim 16, HAMAMOTO et al. discloses a thermopile that is a component of a thermal sensor package (1st sentence, **[0002]**).

r. With regards to claim 17, HAMAMOTO et al. discloses the first and second conductors which define steps and are traversed by the third conductors (FIG. 2).

s. With regards to claim 18, HAMAMOTO et al. discloses the surface defined by a second dielectric layer (5, FIG. 2) on a substrate (1, FIG. 2) and each of the first conductors (6, FIG. 2) is on the second dielectric layer.

t. With regards to claim 19, HAMAMOTO et al. discloses the second conductors (8, FIG. 2 {the portion filling contact holes 7a}) having lateral widths less than lateral widths of the first conductors (6, FIG. 2) so as to define steps from the substrate to the second conductors, the steps being traversed by the third conductors.

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

DU et al. (U.S. Patent 6,300,554 B1) shows thermoelectric sensor not claimed in application.

KUBO (U.S. PG-Pub 2002/0069909 A1) shows thermo sensor not claimed in application.

MORITA et al. (U.S. PG-Pub 2002/0069910 A1) shows thermo sensor with dielectric layer being thinner than second electrode not claimed in application.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DUSTIN Q. DAM whose telephone number is (571)270-5120. The examiner can normally be reached on Monday through Thursday, 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Barbara Gilliam can be reached on (571)272-1330. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

dd

//Barbara L. Gilliam//
Supervisory Patent Examiner, Art Unit 4128